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THESE PAPERS ARE FROM THE EXPLORATORY CONFERENCE ON "TECHNOLOGY AND THE FUTURE OF MAN AND SOCIETY", Geneva, June 28 - July 4, 1970

These papers are circulated for the information of participants in the ecumenical enquiry on "The Future of Man and Society in a World of Science-Based Technology". Comments are welcome.

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EDITORIAL NOTE

This is the second collection of papers and statements on the theme Technology and the Future of Man and Society as presented to an Exploratory Conference convened by the World Council of Churches in Geneva, June 29 - July 4, 1970.

The statements reproduced here were presented in plenary sessions of the Conference and have been transcribed from tapes. The staff takes responsibility for any errors in editing and preparing this material for publication.

Discussion of the ideological and political issues posed by expanding technology was introduced in two opening statements by Prof. S.L. Parmar of India, Principal of Holland Hall and Reader in Economics at the University of Allahabad; and Dr. Jeremy Bray, Mathematician, Industrial Consultant, former Parliamentary Secretary in the Ministry of Technology.

"The Impact of Technology on Man and Society Through Industrialization" was the theme of a panel in which the participants were Dr. Pieter Kuin (Netherlands), Director of Unilever (retired and Visiting Professor of Business Administration, Harvard University School of Business Administration); Dr. A.B. Rofman, Director of the Center for Urban and Regional Studies, Buenos Aires; and Prof. Margaret Mead, Curator Emeritus of Ethnology, The American Museum of Natural History and Chairman and Professor in the Social Science Division of the Liberal Arts College, Lincoln Center Campus, New York.

An address to the Conference on "Men and Machines - The Ethical Challenge of Computer Technology" was presented by Prof. Austin Hoggatt, as his reflection on a computer simulation experiment with members of the Conference. Prof. Hoggatt is a Professor of the Business Administration in the University of California (Berkeley) and an authority on computer technology.

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TECHNOLOGY AND SOCIETY
THE FUTURE OF SYSTEMS AND IDEOLOGIES - TWO STATEMENTS

I. By Prof. S. L. Parmar, India

I would like to start with a very simple, general proposition: that our thinking on the question of systems and ideologies has to move away from the thinking to which we have been so far accustomed. I will try to exemplify this: in the debate between systems and ideologies, the Marxist side has emphasised the slogan "Workers of the World Unite. You have nothing to lose but your chains".

The problem is that today the workers have something to lose, and precisely because they have something to lose, they don't unite. In many societies, not merely the affluent, the working class is tending to become more and more a conservative class. The progressive and radical forces (certainly in some Western societies) which emanate from students and intellectuals, are meeting with opposition from trade unions. When one nation - a large power - aggresses against another nation - a small power - in the same ideological sphere, the workers do not unite. The workers of one nation support the policies of that nation: the workers of the other nation sympathise with the struggle against the aggressor.

Even the workers of poor countries like India and Pakistan or Malaysia and Indonesia, who have no material prosperity to hold them back, are chained by patriotism and national loyalty and are willing to support their respective governments in a conflict. They do not unite by thinking of themselves as a common proletariat.

Therefore, the whole ideological question has now many new nuances. As we are thinking about the future of systems and ideologies, I think our task, really, is to try and indicate some of the directions which the ideological debate might take.

I have four points to share with this conference.

My first point: technology is a vehicle, or a carrier, of economic patterns and systems. In many of our big cities in India, even in some which are not so big, one comes across large billboards where a small Telefunken transistor is advertised: on the billboard you see a small, compact Telefunken transistor, flanked by an eye-catching blonde, young lady. Underneath is the caption "Product of German technology". The transistor or the lady? I think both.

There are elements here which are very significant. We need transistors for mass-communication in India; therefore we need the technology. But with that technology, a certain economic pattern or system insinuates itself into our situation. I mention some elements of this.

The product is important - that is one thing which comes with the technology; the other thing which comes with the technology is the symbol of the young lady as an expression of a burgeoning cosmetics industry in affluent societies.

The third thing which comes to us is a certain pattern of advertisement which may be relevant to market-oriented economies. We have to see whether it is relevant to our situation.

The fourth thing which comes to us is the expression of a high-consumptio pattern, of which both the transistor and the style of advertisement are expressions. A high-consumption pattern is not part of our economic reality; it may be a legitimate part of the economic reality of affluent societies. It is not for me to question the ethics of a high-consumption pattern. I leave that to those who are having that experience. But for our societies the present situation is one where the emphasis should be on savings rather than o consumption. Voluntary savings in our societies are not adequate, simply beca the income of the people is low. Therefore we have to embark upon forced savings, to build infra-structure; to build our agricultural capacity; our industrial capacity. Once you accept this concept of forced savings, then you really have to put curbs upon consumption. Not so much curbs upon the consumption of those who are at the sub-consumption level, because their consumption has to be raised both on economic and on humanitarian-ethical grounds; but you have to curb the consumption of those who are in the relative high-income bracket. Many of the things which come with western technology ar things which cater for the consumption of the high-consumption groups in our society.

If we accept this pattern of consumption, there is a distortion in the investment pattern, because the producers, seeing a larger margin of profit in some of these areas would much rather invest in these areas of secondary consumption; stimulate and keep the consumption level high, rather than produc things for the primary consumption of the masses of the people, or invest in the infra-structure by which our productive capacity may increase over time. By catering for the high-income groups, the elements which come with this technology are also distorting the economic differentials within the country.

Those who have are able to have a steadily higher level of consumption; those who do not have either stagnate or their consumption level recedes. Therefore, within the country you find that the inflow of technology is not simply an inflow of technology - it is an inflow of a particular economic pattern with all these ramifications: increasing inequality, increasing social tensions, increasing awareness of class distinctions.

Technology is therefore a carrier of economic patterns. What do we do about it? We could say that because it is a carrier of economic pattern our attitude towards technology can be one of rejection. I do not know. Of

regulating the assimilation of technology. Possibly. Of not thinking that if we have introduced a planning process through which some technology comes to us then somehow the planning process will build the institutions through which these other problems will be taken care of. Yes.

Perhaps one of the necessary pre-conditions of the success of our planning process must be the building of those institutions which will allow a graduated entry of technology in terms of the social and economic realities of our situation.

It is precisely for this reason that we say that when we are thinking of the impact of technology, we cannot think of it in purely technical terms. Technology contributes to growth; it increases production and efficiency. That is true. But we have to think of it in institutional terms. In that case we will be introducing a new element in this whole discussion of ideology. Purely technical relationships or economic relationships, can no longer be seen in isolation; they have to be seen within the overall socio-political framework of different societies, and the socio-political relations between the societies from which technology goes and the societies into which technology comes.

My second point is that what I have stated above may appear to be a rather parochial or insular approach. And so it is, because obviously we live with our realities and react to issues in terms of our realities.

I feel that a new concern in the whole ideological debate is now emerging: a concern for national self-determination, which may be the new name which is given to nationalism. In our societies the major ideological reality is the reality of nationalism. This is because nationalism is for us a part of a liberating process. We have loyalties to small units: to language groups, to religious groups, to tribal groups, to caste groups, etc. These are loyalties which subvert the total effort of the community to fight against the problem of poverty, deprivation and social injustice. We do not think that there is some political inevitability about nationalism, but our problems are such that to deal with those problems effectively we have to develop a mind set which moves us from limited loyalties to larger loyalties. And therefore in our situation the movement towards national self-determination, which is nationalism in a new form, is a very progressive idea. It is an outward movement; it is not a movement which is inwards; it is not an isolationist movement. Here I pose a question in terms of the ideological relationships in the future: what will be the limits of this outward movement? For me, as an Indian, it would be excellent if this movement could continue until we have overcome some of the divisive tendencies within the country and moved to the concept of a nation and carry on our economic, social and political operations in terms of this concept.

But does it stop there? Because if it stops there then it will reverse itself and become the kind of negative nationalism which we all decry, and should decry. But the possibility of this kind of nationalism continuing to

move out will depend to a very large extent on the pattern of internationalism which is manifest in the world community.

Let me exemplify what I mean. We feel that the technological links between industrial and less industrial countries today have been forged not in terms of our economic realities, but in terms of their economic realities. I don't like this distinction between "ours" and "theirs", but that is the fact of the situation.

In the past, during the period of colonial expansion we had, in many of our countries, modernised industrialised sectors, in the extractive and some other industries. These industrial sectors were set up not as an expression of our economic needs, but as a projection of the economic needs of the metropolitan country on to our economy. A whole theory of international trade was built up to show that whenever there is international trade both parties gain. We in the developing world were sufficiently indoctrinated to accept that theory. Till recently we made such a theory the basis of our trade and commerc policy naively assuming that whenever there is trade both parties gain.

Where is the gain to both parties? If the pattern of specialisation and division of labour is a projection of the economic interests of one group - how can both parties gain? Therefore what we had was small islands of development surrounded by backward agriculture. Therefore our economies were described as milkcow economies.

Even the development of transport and communication in many societies, which were a contribution of the colonial period, and the benefits of which we are still enjoying were a mixed blessing. Because the intention behind that development was to consolidate the power of the metropolitan country, rather than stimulate our economies.

This is history. Let us hope that that is all past, and that we are in a position where new relationships are being forged. But the question is being asked; is the present transfer of technology a projection of the economic realities of the givers, or a response to the real economic needs of the receivers of technology? Is the transfer of international investment and financ in line with the economic needs and realities of the recipient country, or is it a projection of the economic realities of some other country? Is the whole pattern of foreign aid a projection of certain politico-economic concerns and interests of the donor nations, or is it a genuine, authentic response to the aspirations for economic development of the recipient nations leading to a new spirit of partnership and sharing?

Words are very good; words are also very dangerous because sometimes they camouflage the realities of the situation. And merely by saying that there is partnership, or there is sharing, does not mean that the old pattern has been broken.

Therefore, if I say that in our economic thinking we begin by looking at the national situation and wish to move out beyond that, this outward movement must be assisted and continued for that is the only salvation of the human community; that we don't stop at the boundaries of the nation, But in order that the movement might continue we need to re-structure economic and political relationships which have so far prevailed in relationships between powerful and less powerful nations.

My third point: if we look at this problem then from the point of view of our realities, it really means that we are trying to search for a new understanding of politico-economic problems. An understanding which may require a very new approach. I was greatly encouraged the other day when, in the discussion, one of the members of the conference spoke about the need to develop a new approach in economics.

I submit that there is a possibility for evolving a new approach in terms of our experience. I have already said that the political frame-work becomes very important in economic considerations. Economics is no longer economics but political economy. That is the first thing which we are learning.

In our ideas about the goals of economic development a new approach seems to be emerging. If we say that there should be participation of the people in the planning process, then to encourage people to participate more has to be spent on welfare, hence less is available for investment in direct production. If we believe that social justice is more important we must be willing to accept a slower rate of growth.

So far we have all been obsessed with the idea of a high rate of growth. But if social justice is given pre-eminence we have to shift our understanding of what development is. The mirage of catching up with the rich nations is not an expression of our economic realities. How does it matter whether we in India catch up with the USA or with Japan or with the Europeans? What is important for us is to constantly perform better than before. This whole matter of the widening gap between the rich and poor countries is an international problem, but I in my situation am more concerned, and should be more concerned, about the widening gap between the rich and the poor in my own country. And that I can see only if I look at the problem from within the realities of my situation; until we have struggled and come to a pattern of social justice and economic equality, within our own situation, we neither have the credentials nor the moral power to struggle for economic justice in the world-wide situation.

My fourth point is that technology is power. That power is never neutral. That therefore technology is never neutral.

Why do I say this? Because power always comes into a given situation and from the very beginning, whether it is technological power or any other kind of power, it can be understood only in terms of the elements of that situation.

We have nuclear power, we say that it can be used for the betterment of humanity or it can be used for destruction. But we must remember that nuclear power came in a given situation. It was contaminated at the time of its birth, and consequently our struggle at the moment is how to civilise nuclear power. It is not neutral. It has already taken a position. Similarly, all kinds of technological power comes within systems, within ideologies, and it becomes the carrier of those systems and ideologies.

Today a new ideology seems to be emerging which frightens us in the Third World. It cuts across the old ideological patterns and leads to greater collaboration between those who have and dispense technological power. The USA and the Soviet Union can avoid confrontation, in fact they have to, because if they have direct confrontation in a military sense of the word, they destroy themselves and perhaps destroy the world.

We feel, maybe wrongly (I would very much like to be so convinced) that just as during the period of the economic depression nations were trying to export their depression to which the phrase "beggar my neighbour" policy was given, so today the big powers are trying to export their tensions to us. Instead of having direct confrontation they can have confrontation by proxy in Vietnam; they can have it out in the Middle East; they can have it out in our sub-continent when India and Pakistan decide to battle each other; they can have it out in Africa.

I respectfully submit that the notion that poverty is a threat to prosperity, that revolution in some of the Third World countries is a threat to the stability of the world, is unacceptable to us. When have the poor started conflicts? When have small nations started world wars? Not too long ago after the coup in Indonesia several thousand people died in the aftermath. What happened in the world? Nothing happened. There were talks in 1966 and 1967 that there is going to be a world-wide famine and millions of people would die. I don't think anything would have happened to the world if those millions of people had died. There have been revolutionary situations in many countries and they have not at all disturbed the stability or peace of the powerful nations.

This tension between the powerful and the powerless is an expression of a new kind of ideology. I wish that the powerless had the power to disturb the powerful. I wish very much that revolution in one place could create disturbance everywhere. It does not. So I come back to my earlier questions: how do we keep the nationalistic process open by working for a new internationalist process? How do we see the ethics of the relations between the powerful and powerless, as one of the consequences of technology?

II. By Dr. Jeremy Bray, Great Britain

In talking about technology and its impact on society, the starting point might be the specific technologies which have so great an effect - in communications, in the development in agriculture, in the development in methods of birth control, etc. But I address myself to the ways in which the ideas of technology, and the methods of applied science infect or impinge upon the political process. I firmly believe this is not to de-humanise either technology or politics. Professor Mushakoji, in the first session of this conference, eloquently drew out the parallels with systems analysis. The secret of the success and the virtuosity of the American space effort was the decision at the very beginning to put a man in the rocket and fully involve man in the process. The involvement of man with his environment really does mean having to use the most powerful methods available to get hold of that environment.

I shall speak about the tools I have found useful in my efforts in this direction. I regard them only as tools to be picked up and used as long as they are useful and later perhaps to be laid aside and replaced by better tools.

As a student I was impressed by the early developments of computing and became involved in some of these at Cambridge University. I attended Claud Shannon's Information Theory seminars at MIT: I went from mathematical research into process control and optimisation of the chemical industry. Here, in a chemical plant, one is confronted with a more unpredictable, organic and less known creature than in most electro-mechanical systems. At the same time, living in an industrial area confronted me with the problems of industrial re-development, the run-down of old industries and the development of new ones. Finding my way into Parliament, I got involved in the reform of the British Civil Service and the design of a new system of national economic statistics. I was one of the Ministers who put through the nationalisation of the British Steel Industry which I suppose is the biggest measure of socialisation in the West in recent years. I was concerned with the design for national fuel policy which broke new ground in national planning and in the Ministry of Technology.

In a socialist government, we messed around more with private industry than any committedly capitalist government would have done in terms of re-structuring and merging big companies and negotiations with the international companies. Currently, we were beginning, just before leaving government, the planning of the doubling of higher education in the next decade, a major problem facing all European and many other governments today. Against all this, every democratic representative and certainly every member of parliament has a continual stream of social, indeed almost pastoral work, and not least in the marginal constituency which, alas, I was unable to hold in the recent elections. So I have all too immediate an experience of the involvement of democracy in governmental and technological processes.

In light of vast changes in the circumstances of living, people want to have their problems made the stuff of politics. There is scarcely time for political slogans and party loyalties to catch up with the changing aspiration and problems of ordinary men and women. Yet, in this process of change, political action is more necessary than ever. If radical parties are not relevant, people will seek refuge in the past, in prejudices against minoritie and in self-pity. But political thought, I believe, can only come to grips with changes wrought by technology and society if it masters the language and methods of technology. Politics can make itself the slave of technology eithe by ignoring it or by lacking any deeper understanding of the nature of man and society. Those who cling to the arts and concepts of government, suited t a past epoque become as much victims of technology as those who suppose that mere technocratic changes in the machinery of government can cope with the increasing tensions in society.

What should be one's starting point as a scientist, an applied scientist and technologist, engaging in some area of activity where you are concerned both with being a man but also seeing what you can contribute from your specif background of experience? It is in the method by which you work that enables you to look at this field afresh. Of course the cycle of scientific research, moral, prediction, experiment, new model, better prediction, more experiment, is not directly transferable to the world of applied research let alone applie politics. The cycle of applied research is more extended. It includes objective, hypothesese control, action, prediction, vary the hypothetical acti revise the prediction, repeat to select an optimum, act, observe the behaviour redefine the objective, revise the model, update the prediction and optimisation, act again, continue to observe - all this in the light of the external world. This is a cycle of activity going on all the time and like all cycles, it is difficult to know where to break into it. The conventional place to break in is to say that you must first define your objectives. I would accept this, if by this one means objectives in terms of human relationships and relationship to God. If you are talking about political objectives, I think it is very dangerous to start by defining political objectives before you have a political model; before you know what you are talking about.

The Western European political tradition would put forward two alternativ models of the state. I draw these out of the western political tradition and they would not necessarily be applicable or relevant to other political situations. One is the state as an entity - the monarch, set over and apart from the people, with the state and the people bound together by a mutual system of rights and obligations. The other model is the state as a relationship not as an entity. This means that it stands alongside other relationships, alongside the family, alongside the factory, alongside the trade union, alongside the local community and must consider what role it has in all these different relationships. Generally, the pattern of western political thought has been for the statement of socialist policy, put in terms of the model of the state as a relationship, and the critique of conservative policy which has worked

with and has criticised the view of the state as an entity. Thus the socialists affirm that equality is desirable because the state is an aspect of the relationship between men - it should be so arranged as to increase equality. On the other hand, the Conservatives, using the state as an entity model would say that for the state to enter into the relationship which is between men, is to introduce an alien factor into their relationship which can only reduce their freedom and impose a conformity. So on through the different attitudes to competition and planning, to relationships between employer and employee. If starting from models at this level of abstraction you try to make the transition each time to whatever the problem may be that you are dealing with (the pros and cons of capital gains tax or the organisation of secondary education, or whether or not to join the European Economic Community), you find that you are covering the same ground over and over again in the intermediate levels of argument. I am sure that intermediate concepts are needed and it is at this level that we begin to introduce the Christian, humanist or other biases.

I would suggest, for your consideration, within the framework of western democracies three intermediate concepts, which I believe lean upon the Christian faith.

First, the concept of the open state. One must affirm that the workings of the state should be known to the members of the state in a complex modern society. If that complexity is not operable by an ordinary citizen, the state is not an open state, and is not in an acceptable condition. This is certainly needed to safeguard the rights and interests of the individual. It is also needed to maintain coherence within the state itself because of its complex apparatus. Any kind of coherence in policy requires that the processes of policy development and implementation be open. The only way of securing an open state is effective democracy and I mean much more than free and continuous elections. I mean the very structure of democracy itself: the relationships between the government, the democratic assembly, the judiciary, the methods of determining and allocating public expenditure, and the review of such allocations: the relationship between this and the social objectives that society and the government wish to set: the structure of public authorities, particularly of local government: the relationships between different levels of government - all these are necessary and need to be explored, designed and re-designed to keep the state an open state. This derives from the importance, attached by Christians, to the truth. We believe that unless we really see what it is we are talking about, we cannot effectively engage in that relationship. It affirms the personal nature of the truth. You cannot merely state and describe a system like a state. You have to open it up and be engaged in it. It has to be accessible to every citizen.

The second intermediate concept I suggest is the regenerative society. It is not enough to be equal in a rapidly changing world. The question is "equal with what?" In what sense is the daughter of a coal miner equal with

her father when the last thing she wants to do is to marry a pit man? She wants to go and work in the city. She does not want to live in a mining village. She wants the pit closed down as quickly as possible and to get out of it. Her father wants the pit kept open. He wants to go on working with his mates and go along for a drink at the Miners Welfare and to have the annual gala in the Cathedral down the road. These two wishes are mutually incompatible How do you describe equality here when you close the pit? What rights has the miner got in terms of rates of pay, new employment? How do these relate to the rights of his daughter and the kind of life style she wants? We have to develop the concept of the regenerative society which recognises that it is not perfect. At the same time, society in its present state as well as in its future development, is capable of realising more fully the potential for good of each person.

A regenerative society is a dynamic concept in a way in which welfare, equality and even brotherhood are not. It translates them into terms appropriate to a rapidly changing situation. It draws very heavily on the Christian understanding of the nature of redemption, a concept which has great relevance for anyone who has managed a social security system or an industrial development policy in a declining industrial area, or a re-training policy for skilled workers whose skills have become obsolete.

The third intermediate concept is that of an adaptive economy which suggests a certain style in running the economy. We have greatly benefited from the various concepts in economic management: Keynes' Management of Demand: the overall optimisation of economic activity described by Frisch: the planning concepts of Mahala Nobis: the style of French planning as designed by Monet and developed by Massé: the methods of controlling expenditure and guiding expenditure towards goals, developed by McNamara. I would suggest that none of these styles of economic management is able to cope with the particular problems of economic management today. What is needed, I suggest, is a policy of disaggregate management of the pressure of demand, a process of finding the ecological balance within the supply and demand of particular industries. Planning must be a diffused, not a centralised system of decisions, but it must be centrally conceived, discussed and accepted. The planning system must embrace the style of decision-making within the company as well as the relationships between companies and the decisions of government.

Such intermediate concepts should be the distinguishing feature of a modern state, if it is to really "open". A regenerative spirit and a new style of economic management are essential requirements for effective participation and personal involvement in society. It means the development of local democracy, enabling people to shape the life of the community, the environment in which they live, industry allowing workers to share in the decision-making process within their own companies and within the wider nexus of consumers and suppliers.

These thoughts have been churned out under the pressure of current responsibilities within a western democracy. I would not claim that they apply directly to other situations. For example, take the case of Japan. Here the idea of the state as a relationship is perhaps all too firmly held. Perhaps what our friends in Japan need to do is to externalise the state, to get it out of their system, to cease to regard all their relationships as hierarchical relationships within the firm, in turn extended to the wider framework of government. This is a framework from which they have to escape, though they cannot simply take over the concept of the state as an entity because that would not do either. But one must have some kind of conceptual model and one must be concerned with the quality of that model, and the range of intermediate concepts and finally with the specific aspects of the machinery of government and the methods of decision. The groundwork for participation is thus established: it is a continuing activity into which one can break at any point. The model, intermediate concepts and participation are all mutually linked together within a framework which enables society to hold together and to work effectively towards its own fulfilment.

III

IMPACT OF TECHNOLOGY ON MAN AND SOCIETY - THROUGH INDUSTRY

(a) Paper by Dr. Pieter Kuin (Netherlands)

It is important to see, in human terms, the technical and economic progress we have made during the last three or four generations. I can illustrate this in a very personal way. My great grandfather was a small market gardener who toiled 16 hours a day and finally drowned himself because he could not make his little farm pay. One of my grandfathers was a market gardener who only realized a worthwhile life and future for his children when he turned to industry and became a small cheese manufacturer. My other grandfather was a labourer who worked very hard on the roads of the community, though the work was unsuitable to him; essentially he was a village poet and speech writer. My father, when I was very young, worked 16 hours a day also in various jobs to make a living and only improved the outlook for his family by moving to a city where there were better schools and a less strenuous job for him.

People of my generation have much reason to praise the progress in technology and the standard of living which has resulted. We have memories of primitive working conditions which drained the physical energy of both men and women. We remember the long depression with its great uncertainty when many families fell by the wayside. Especially in my country we remember the total disruption of production, and distribution of goods and services during the last period of the war and occupation. We appreciate the gifts of a better organized economy - a more abundant supply of goods and services; and a more dignified way of living; a more joyful existence for families; and more abundant leisure. We have little time for those who are blasé with prosperity earned by their parents. They do not realize how precarious prosperity is. In our modern, highly complicated life it takes only a little disturbance to threaten not only our prosperity but also the community of our material side of life. Our generation also has sufficient awareness to realize that technology, whilst solving many problems also created others. We have seen cartoons about pollution. We hardly need to be reminded of it. It appears in every newspaper and every meeting has as a central theme: crowded city centres, accelerated use of limited resources, boredom and work - unemployment, perhaps.

I have been asked to give the viewpoint of industry on the theme: "Impact of Technology on Man and Society through Industry". My special approach for this morning is the Role of Industry in Technical Progress and How Life in Industry is Affected by it.

Industry and its services are the scene of the daily, working life of the majority of people in industrial countries. The problems of technology can be solved. The solution depends, to my mind, on two things: (a) better and more technology, and (b) better management of technology. This is largely a task industry. Industry is the great creative centre in technological progress. The consumer has never invented anything. Everything we enjoy has been invented by industry and developed by industry. It may have been invented by some lonely genius, but it has been developed, produced and distributed on a large scale by industry taking the chances of the market. All innovations and progress depend on dynamics and inventiveness of industry.

Office workers have not invented office machinery which makes their work easier and more productive. Governments using computers and technical devices in their services have not invented these devices.

Technological progress is man-made, and it is largely 'industry-made' and the fruit of extensive research and development. This is financed out of appropriations by managers who are constantly probing the potential use of matter and the needs, especially the future needs and wants, of man and society The needs of man, as expressed in his willingness to spend money on certain things and not on other things and of society, as expressed by public spending and ongoing legislation.

Technological change created by industry also has an impact on industrial life itself. It tends to promote larger and more costly equipment; therefore, production on a larger scale, with longer runs. It induces more standardizatic to bridge the gap between large-scale distribution guided by high level marketing, and larger forms of work organization with longer lines of information and command. More standardization means an increasing role for quantitative perception and planning, greater use of mechanical and electronic devices in production, administration and distribution, and higher break-even points - the use of capacity below which losses are incurred and greater dependence upon regularity which means vulnerability to interruption. These are interesting points for managers, but they also have consequences from the human point of view. Technological progress in our working lives means several things. One of them is the ascent of reason over temperament, over arbitrariness and autocracy. The autocratic, arbitrary and temperamental manager is unfit to be the leader of a modern technical organization of work. It also means a greater need for adjustment and (if I may use the word) obedience to the organization. It alters the mental quality of work for some and presents a danger of boredom for others. It means continuous adaptation to changing equipment and methods, and therefore, rapid obsolescence of leadership and management methods. Emphasis shifts towards the young and adaptable and away from the middle-aged and rigid who may face grave personal problems at all levels from worker to management director.

I would like to enumerate what I think are the tasks facing our societies as a result of rapid technological progress: (1) responsible use of resources, including a more even spread in space and time; (2) new technology to eliminate the unwanted consequences of the old. This is possible but requires a lot of money and effort. Carbon monoxide in exhaust gases can be fought by going forwards and this will cost money. Detergents without phosphates, or without petro-chemicals are possible but will be more costly and perhaps less effective.

Better management of technology has to link the dynamics of competitive industry with essential regulation by government and legislation. In a competitive industry one cannot leave it to one or two parties to increase their costs because of better technology or by more responsible use of resources. They will lose out to their competitors. There has to be a framework of legislation which makes this mandatory for all. Adaptation of technology to local circumstances and stages of development, emphases on saving and investment may seem boring economic subjects, but all this is costly If we go all out spending our income, we shall not have the means to finance this new and better technology. At all stages, from the poorest country to the most prosperous, there will have to be an emphasis on setting part of one's

income - a large part of the national income - for investment in better equipment; and better means to finance innovation. It also implies another task - getting used to larger social and political dimensions as opposed to a tendency in various continents, to emphasize nationalism. Nationalism can be a progressive and positive force as long as it means overcoming the obstacles of provincialism. When it becomes an obstacle to world-wide planning and distribution, nationalism becomes a reactionary force.

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(b) Paper by Dr. Alejandro Rofman (Argentina)

One of the main features of the present social, economic and political process in Latin America is the discrepancy in the rate of growth between the industrial product, gross industrial product and employment in the industrial sector. This datum which might appear purely incidental or unrelated to other factors, nevertheless has a basic significance which is worthy of note. The process of internal migration from country to town has rapidly increased in the last 25 to 30 years. At the same time manufacturing industry is the only sector of the economy which can provide highly productive employment. It is therefore essential that the process of incorporation of this rural man-power into the urban sector should take place in the fundamentall dynamic sectors. If the urban manufacturing sector is very slow in making demands on man-power, a disruptive factor is at once introduced into the phenomenon of internal migration. Rural workers go to the towns but do not find well-paid, stable jobs. Furthermore, another rather strange phenomenon is linked with this in the economic panorama of Latin America. In almost all Latin American countries the gross industrial product is increasing very rapidly. How is it possible, it may be asked, for there to be a growth in the product without there being increased employment? This is in fact the very problem which I want to deal with. The industrial expansion is of such a kind that it causes disharmony between the three factors which we have mentioned: High rate of expansion of the gross industrial product, slow or even declining rate of incorporation of man-power into the industrial sector, constant increase of rural migration into the urban centres.

This triple phenomenon, which we have envisaged until now only from the demographic and economic point of view, involves very serious social factors. The first and fundamental one is that the rate of unemployment and under-employment in the urban centres tends continually to increase. What until 20 years ago was a phenomenon reserved exclusively to the depressed areas of the Latin American urban system, the areas untouched by the industrial revolution, where there were still relics of feudalism, has now become a feature of the most highly developed metropolitan areas. It is paradoxical to see how the rate of unemployment in the most backward urban centres is now being equalled by the unemployment figures in the most highly developed metropolitan centres. Both phenomena are due to completely different causes, but the problem is that while unemployment in centres which formerly were under-developed is gradually disappearing because of people leaving them, unemployment in the most highly developed and populous centres is gradually increasing through immigration.

What kind of social effects does this phenomenon detail? In the first place there is an increase in the population without regular employment. For example, the rate of unemployment in the largest urban centres in the Argentine, which certainly must be the lowest in all Latin America, is equal to the rate of under-employment, that is to say, among persons who come onto the urban labour market but can only find occasional employment. In Buenos Aires, Rosario and Cordoba, three of the industrially most highly developed metropolitan centres, the combined figure is more than 10% at the present time. This phenomenon implies that the city-dweller is increasingly unable

to supply his needs. He cannot give his children the education they need, he cannot find the accommodation he needs to live decently, he can have no share in the process of saving which is necessary for investment in social and political improvement. It may be remarked in passing that a survey made in the Argentine only six years ago showed that 40% of the population does not save at all; in fact they are spending what capital they possess. What are the causes of this phenomenon, and what possible solutions are there?

The root causes lie in the structure of external dependence and internal domination which characterize the Latin American countries. Industrial investment fundamentally rests in the hands of big foreign firms which import the technology which they have invented and designed for the development of their own countries. This introduction of technology carried out straight away in countries where the increasing absorption of man-power into industry would call for processes which made a more intensive use of man-power than that of capital, disrupts the whole urban labour market. Yet this phenomenon takes place unhindered because within the various countries the internal power-structures permit, make possible and facilitate the process of importation of foreign capital and technology. Instead of making an effort to avoid the impact of this phenomenon, they in fact benefit by it. The effect of this process of industrial investment is that the old enclave formed by the Brazilian plantation, the Chilean mining company, or the banana firms of Costa Rica or Honduras, is now replaced by the big petroleum firm, the big steel works, the big oil refinery, which import their equipment, their technicians, and select a restricted group of highly specialized workers. All the profits they make are sent abroad, and this is encouraged by the exemption from taxes granted by the Latin American country in order to stimulate this process of investment. It is paradoxical to see how this supposed modernization to a large extent involves marked regression in regard to distribution of income, employment, internal repercussions on the industrial process and an increase in income for the foreigners working in what to them are peripheral countries.

Consequently this phenomenon must not be regarded as an isolated case; it is part of the great present-day pattern of external dependence and internal rule in these countries. Nevertheless I think it would be dangerous, and at the same time incorrect from every point of view, to describe a situation as grave as this without at the same time outlining some possible solutions. I continue to be optimistic - even though I see myself becoming more and more alone in this. I do so because I think that the forces which for so many years inspired the processes of national and social liberation in many Latin American countries, if they are strong enough to act in the conviction that the support they need is going to be given in every practicable way, and if they have the certainty that their action is not going to be violently suppressed, may once again set in motion a great process, the second liberation of Latin America. In this respect it is essential to realize that all the innovations that are introduced, imported, or added to the social, economic and political structure of Latin America, must be adapted to the real conditions of the countries in question. A phenomenon such as technological innovation, though welcome in itself, as it undoubtedly ought always to be, needs to be adapted in structure in the use it makes of man-power, in the way it fits its increased investment into other economic activities, in its localization, which at the present time is producing in Latin American urban centres the phenomenon of metropolization which is very familiar in advanced countries but which the Latin American countries have not the resources to meet, as is

shown by the very low rate of building and development in towns. For all this to be possible, changes will have to take place in the structure of power, of internal domination. This is the primary factor. As with every phenomenon in the social sciences, we have to realize that there is a causal nexus to which no social scientist can shut his eyes, on pain of ceasing to be one. The causal nexus here is rooted in the structure of internal domination and external dependence, while the effect is evident in the way in which these structures make themselves felt in the influence of technology imported from abroad with strong and unfavourable consequences for the demand for man-power, in the distribution of income, the occupation of urban space and in the limits they set to the possibility of efficient and adequate public social organization

I therefore conclude by insisting that the process of industrial development in Latin American countries cannot be regulated and guided by goals of efficiency and integration, even if these have proved useful in developed countries. If that is so, a possible solution would be to modify, adapt and transform the phenomena which are important in the real social, economic and political structure of Latin America.

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(c) Paper by Prof. Margaret Mead (U.S.A.)

First I would like to place technology in the history of this world in which we live, because there exists a terrible tendency to divorce technology from man and nature treating it as some kind of special intrusive and diabolical force. We rarify it in titles. We talk about what technology does, "the impact of technology on". We treat it either as a separate layer - as the technicon or as some dangerous or beneficent invention which has to be treated separately from the rest of man's life and the living world.

It is helpful to realize that most of the complex technology we have today is an extension of the biological capacities of man: man's capacity to use tools, his capacity to foresee events, his capacity to think about events at a distance, his capacity to learn, to accumulate, to use his past learning, his capacity to learn as an adult from what other people have done; his steadily decreased dependence upon the type of biological mechanism that other creatures depend upon, and his increasing dependence upon the accumulation of knowledge about the world which can be translated into the way he lives in the world. But this is still biology. It is not some special intrusive strange kind of event. It is true that birds only build nests, beavers only build dams, and man has gone infinitely further in what he can do. But I believe this should be kept within the biological order and not treated as some separate set of circumstances, some peculiar type of event.

It is useful to see man among the other species of creatures on this planet as having the highest capacity for negative entropy for the organization of life and for the reduction of deterioration if he can use this capacity comstructively. It is very important for us to realize that the crisis we are facing has two aspects. One is the aspect that has developed directly from the speed of technological invention in the last century and the other aspect, an ethical crisis, stems from it. However much man has believed in the brotherhood of man, this is the first time in human history he has had to meet all his brothers. He has had to come face and face with them.

It was a very different thing for prophets to speak of man and all men as children of God; it was a very different thing for men and especially saints through the ages to maintain they would not feast while others starved. They kept alive the idea of brotherhood. It is very different today. People everywhere on this planet are in communication with each other. In the centre of New Guinea as well as in the centre of New York City, men can see what is happening to each other; they can compare their lives. They can have aspirations for their children on the one hand, and criticism of the way in which they themselves are living on the other, that have never been available before.

There is a great tendency for man to castigate himself today for what he knew only yesterday. We should realize how tremendous and new these pressures are. The analyses of Dr. Kuin and Dr. Rofman help us see the consequences of attempting to spread our technological possibilities rapidly over the face of the earth, and the dire consequences these have produced

in the lives of many people, perhaps most of all in South America. Nevertheless, we must realize that it is only twenty-five years since the end of World War II, since we began to speak about one world which should share in the technological advances of the whole world.

We recognized that it would be possible to feed the people of the whole world, and feed them properly; and we began to aspire practically and idealistically to a standard of life for all men which would satisfy the consciences of those who had been affluent and the hopes of those who had been poor, a poverty which they were often not conscious of.

One of the problems today is that because of technology many things are interlocked and have to be done at once. It is impossible to emphasis enough the urgency of the series of problems facing us today due to the tremendous advances in science and their technological application. We must control scientifically-based warfare - nuclear, biological, chemical - because if we do not exist it is of little moment whether our cities are filled with smoke and smog or not. We must do something about population explosion at once because already we have more children to care for than we can possibly care for; it must be done at once, not 25 years from now. We must do something about pollution at once, or we will have more dead lakes, more dead rivers and the possibility of the total contamination of the oceans which will affect all people of this earth and make it quite impossible to restrict the consequences of pollution to the highly-industrialized countries where the pollution is worst. We must do something about the process of urbanization, a process which stretches into the most remote parts of the world. We are building today the cities of tomorrow which will bind our populations often in poverty, often in crowding, often in disease. We are here making commitments which will last for the next 50 years. This is the nature of cement. The great city planners continually remind us they have to build tomorrow; the tomorrow when buildings will be torn down, new excavations will be made, roads will be built that will produce worse transportation snarls or cut-through communities and separate one sort of people from another within our cities. The urbanization crisis, the need to plan with the greatest care and the highest use of simulation and prediction, is an urgent part of this fourfold set of problems which face man as we confront the fact that we are now all known to each other. All known as the members of one species, living on a known planet. When we spoke before of the children of God, we spoke in terms of idealism, of revelation and of poverty. Now we speak of people we know, and for whom we are responsible. We are spurred on by the new generation of young people, born since World War II, into this new world, with this new perception, who are asking the older people and also by analogy often the older industrialized countries, to use their power and their leverage on behalf of the new vision the younger have. Our goal is not uniformity but diversity; diversity within which no group of the children of God fall below the necessary that we know is possible for all the people of this planet.

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ON MEN AND MACHINES - THE ETHICAL CHALLENGE OF COMPUTER TECHNOLOGY

By Prof. Austin Hoggatt (U.S.A.)

There have been some fears expressed about the machine. There is not very much that one can do to eliminate those fears except to laugh about them and to try to exorcise them with understanding. In my work here, I have been trying to help you understand.

We are engaged in a number of debates. Some of these involve the question as to whether organization of production will be centralized or decentralized. The argument until now has been that we cannot centralize and plan because the calculations cannot be carried out. With regard to the organization of science, we have pursued a policy of decentralization, each scientist free to pursue his own studies under a decentralized scheme. This scheme has been justified by the assertion that science cannot work unless the individual scientists are free: free to pursue their own goals, their individual researches, and free to release whatever results they obtain. There is a great assumption which lies behind all of this debate. The assumption is that the world system is stable and that small changes in inputs are associated with small changes in responses; excesses are corrected naturally in this idealized system; and, when pushed away, the system returns as if by magic or by the unseen hand of God to a stable and viable position. Now, this is a faith in a system and in its behaviour which we are beginning to question, and this questioning has led some people to comment that we might have to regard nature as an opponent against which we would have to protect ourselves and play what has been referred to in an earlier plenary session as "games against nature". That attitude is non-cooperative, and those who study game theory know that when you play non-cooperatively game situations in which there are possibilities for cooperation, the inevitable result is great waste and losses to all of the participants in the game. We cannot afford to approach the present crisis in the spirit of a game against nature; to do so would insure a loss.

Most of the assumptions on which we base this model of a stable world-system never were true; or, if true in part, that part is lessening as time goes on. Several years ago, for example, a few of us informally estimated that it would be possible to compute a one-year Russian plan if we employed for one year all of the computing power in the United States. The computing capacity in the United States is increasing rapidly so that by now it would be possible, if that earlier estimate were correct, to compute that plan with about 10% of our capacity. The great debate between centralization and decentralization can no longer be shut off with the argument of non-feasibility. If we in the West want to buttress our ideology, we are going to have to do so with a better argument.

The stability of the world system itself <u>never</u> was true. If you read the record in the rocks and examine the orientation of the magnetic particles which are embedded in the stone, you will find records of cataclysmic shifts in the direction of the pole of the earth; and there are other records of cataclysmic changes in climate and other parts of our natural environment. When viewed on the geologic time-scale, therefore, that stability to which we keep expecting the system to return is only a local one. Turning our

attention to science again, we must say also that, of course, science can be pursued when men are not free. The great scientists operating under the sway of the Inquisition produced results that today are still in the front rank. Those contributions were made under social systems in which individual scientists were not free to speak as they believed.

Many men have come here to Geneva and have spoken of crises. I would like to interpret, if I can, what that means. The message that we hear from each one of the scientists is that in his own speciality results are being obtained which will be de-stabilizing and they see no force from the other direction. Their universal plea is that we find some form of organization in which stabilizing forces can be brought into play. We have come to believe that the world system with which we are dealing is excessively fragile. Now, what does it mean to try to overcome this fragility? One solution, redundancy was proposed in an earlier meeting. By redundancy we mean that we create copies of things so that if one fails, we can rely on the other. In computers redundancy would be at least factor of three because we want a majority and with two things they can either agree or disagree and, if they disagree, we do not have a majority. That means that we must produce whatever it is that we are producing, if we choose to do it through redundant techniques, by allocating three times as much resource as we did before in order to get the stability which we are seeking. Think what would happen to the Western World if it suddenly found that it had to allocate three times as much resource in order to do the necessary production for everyday living! Our standard of living would move rapidly in the direction of that of the Third World.

What if we recognize the full costs associated with production, that is, include those costs imposed on others, which are often referred to euphemistically as pollution, or should I say Eucharistically (we all partake of it whether we want to or not)? That could be on the order of 30 to 40%, which is still a large step down. If, on the other hand, we might accept computer control and were very clever about how it was put together, we might in many cases be able to do with only a few per cent increase in costs. With a potential return of this magnitude, it is well that we consider using machines in those cases where they are applicable instead of rejecting them out of hand. In any event, we are certainly dealing with higher costs; and we will have to lower our aspirations for physical wealth. Fortunately, the Christian message teaches one how to deal with that. It is, after all, a message for the poor.

Our currently decentralized organization of science unfortunately lacks the integrating force which is present in the decentralized market systems which serve both the socialistic economies and the capitalistic economies. The fragmentation of scientific disciplines has led us into a dangerous situation in which integration and control must be introduced; and the scientists, whether they like it or not, will have to accept this diminution of their freedom in order that they can continue to contribute to the common good. In my state of California, a crude form of control is being imposed via the budget. Universities, which might be future-oriented and which then might be able to help with the difficulties in which we find ourselves, are being quietly dismantled. The computing system with which many of you had a chance to interact here is a copy of one which I have been running for a year under a grant from President Hitch's fund for innovation in teaching. Unfortunately, that computing system was discontinued yesterday (July 1, 1970). It is no longer available to any of the scholars at Berkeley because

we could no longer afford it. This might be a reaction against the stream of innovations which we have let loose in our culture and which may be thought to have led to symptoms such as student unrest, but I doubt that it was arrived at by such a rational consideration. This example shows that if we do not impose controls in our academic institutions by rational processes from within, we shall be curbed from without via the budget-reduction process or by specific legislation.

Now on to the computer! This device is an amoral amplifier of human intelligence. (Translators, I hope you get that word amoral correctly. I'll repeat it, "non-moral". If there is any morality around, it must reside in the men that are part of that system.) It can be used to amplify the intelligence of a scientist working in a narrow discipline, in which case it is quite possible that it will contribute to the destabilization of the world system which is thought to be getting out of control as a consequence of uncoordinated, innovative inputs.

Another way in which we may use this advice was illustrated by the international-aid game that we have played on the computer. This way of using the machine holds the possibility that power may be applied in stabilizing ways. The systems over which we must gain control are so large that no one of the workers on the models which must be built could possibly have the expertise to analyze them once they were built. The available knowledge or intelligence, then, must be amplified. The way this is done is for each specialist to suggest relationships among the variables which are under consideration which, from his technical expertise, he knows to hold. Then a programme is written in the language of the machine to reflect that structural constraint which he has posed from his technical knowledge.

Once those smaller programmes are written, it becomes possible to build a higher-level programme to pull them together into a great matrix of all of the constraints which bind the variables with which we are struggling in some larger domain. That done, the computer specialists can take over and, with the aid of the same machine, seek to work their way through this great logical maze of constraints to that smaller list of possibilities which are still within our set of alternatives which have not been bound out by one or more of the technical contributions, which, each one by itself, clip away a few pieces of what others might have thought would be possible. The hope, of course, is that when all of those constraints are considered, the remaining list is not empty.

If there is only one alternative in it, then there is no problem of value: if you have only one thing to choose, ethical and value questions are probably irrelevant. If there is more than one viable alternative, the question of which one becomes paramount. Usually systems which we have put together in this way produce lists of alternatives the members of which are very far apart. For some, men may be free; in others, they may be bound. It is up to us, as men, not as scientists but as men, to choose the values to be attached to these alternatives so that ones which we want may actually be selected. Here, of course, is where the church comes in, as keeper of the values.

You may now see that what we have constructed in our machines are synthetic research assistants, or mechanical slaves who will do our bidding if we so instruct them. There is one thing about a technician: if you ask him to work for you and you do not tell him what your values are, he will

try to employ his own. If that technician loves machines, he may further their ends. If he loves men or is told that he must act as if he does, then he may further the ends of men. In that, he is amoral. His technique is available to the highest bidder. We have to buy our slaves carefully and make them do our bidding and impose our values, or the ethic of the machine and its contents will prevail. That ethic will be an unplanned consequence of all of the restrictions and binding functions which have been placed in that system, and its consequences will be unpredictable by us or even by the machine. We must, therefore, find a way to infuse our human values into this process.

I see no alternative ways to think about our problem than this way because to leave our system fragmented and seek for uncoordinated results would be to court disaster. I hope that a cooperation may be entered into between the church and science so that this combination of values (and you are the keepers of the values) and technique (we are the keepers of the technique) may be combined to tackle the crisis problem which confronts us - and that crisis problem is no less than the viability of mankind.

It is an exciting prospect. What scientist could refuse that invitation? I bring from the coordinating faculty committee of my laboratories authorizati to enter into tentative negotiation about how that cooperation might be achieved, and I hope I may take back some tentative response from the church.

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